## BIO-SPHERE PROJECT GOALS

Through engaging students in engineering design challenges in the life sciences, the aim is to:

- *Improve students' attitudes toward science to create the next generation of scientists and engineers*
- *Foster a cohesive understanding of science content*
- *Integrate science and engineering practices to work toward solving real-world, 21st century problems*
- *Implement units in rural and underserved areas*
- *Involve parents and the community*
- *Understand how students learn science across various contexts*
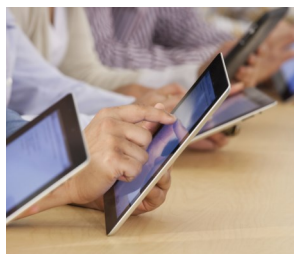
Students can use new simulation and e-textbook software on a variety of devices to do simulation experiments and learn science relationships

Research Participation Opportunities for Middle School Science Teachers

in Summer of 2015 and Academic Years 2015-2017

The Bio-Sphere Project at the University of Wisconsin - Madison is looking for teachers to collaborate on a project funded by the National Science Foundation. Valuable professional development workshops, NGSS-aligned life science units and materials, and stipends are available to teachers who participate fully in the project.
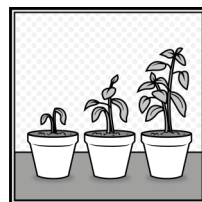
BIO-SPHERE PROJECT

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NSF Funded, Bio-Sphere Project Information

BIO-SPHERE PROJECT

WISCONSIN CENTER FOR EDUCATIONAL RESEARCH

UNIVERSITY OF WISCONSIN-MADISON

Overview of Bio-Sphere Units and Research

All Bio-Sphere units have been developed to address the Next Generation Science Standards (NGSS). Each unit will address many life, earth, and physical science content standards. Students will also learn about crosscutting concepts, such as patterns, structure and function, energy and matter transformations, systems and system models as well as cause and effect relationships.

The units are inquiry and project-based. Students will to work toward solving problems by:

- Generating questions and conducting research
- Making and testing hypotheses
- Identifying variables and collecting data
- Finding patterns in data to understand science relationships
- Using data as support for arguments
- Collaborating with others and communicating ideas

Three Units & Design Challenges:

- Exploring Biofuels!
- Make Your Own Compost!
- Growing Healthy Plants!

Students can think about different ways to grow oil-producing algae in the Biofuels Unit

As an example, the "Exploring Biofuels" unit starts by helping students to understand the role that greenhouse gases play in the atmosphere and health of the planet. To work toward reducing the amount of greenhouse gases in the atmosphere, students are challenged to find ways to make biofuels in small amounts of space using the least amount of resources possible. In the first stage, students brainstorm their initial ideas and questions about how to grow biofuel crops to produce the most oil possible. Students then participate in reading activities on VidyaMap (an e-textbook) and several hands-on and virtual experiments to learn about systems, energy transformation, photosynthesis, and the balance of ecosystems. They will also learn science practices to help them communicate their ideas and successfully complete their challenge.

Integration of Tools to Foster Deep Science Learning:

Several tools will be used throughout the units to support students' science learning:

- VidyaMap e-textbook
- Virtual Simulation Experiments
- Hands-on Investigations
- Small and Whole Group Discussions

Teacher Professional Development:

Teachers will learn instructional strategies to help students to learn science through inquiry. The professional development workshop will be:

- Teacher-centered
- Ongoing during project implementation
- In depth, including weeklong summer workshops at UW-Madison

Teachers will have a chance to build professional networks while working with the Interactive Learning and Design Lab research team and other collaborating teachers during the years of the grant.

Data Collection:

During the grant, the project team may collect the following kinds of data from participating teachers and students:

- Classroom audio/video and observations
- Students' pre & post tests on science content, practices, and attitudes
- Log files of students' use of software
- Students' WKCE / EXPLORE test scores and past grades in science
- Student demographic data
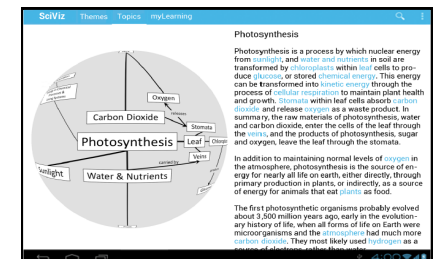
Screen shot of the VidyaMap e-textbook where students can conduct research to learn about science concepts and relationships